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लेपित अपघर्षक — कण साईज का विश्लेषण

भाग 3 बृहत रोड़ी पी240 से पी2500 तक में कण साईज वितरण ज्ञात करना

Indian Standard

COATED ABRASIVES — GRAIN SIZE ANALYSIS

PART 3 DETERMINATION OF GRAIN SIZE DISTRIBUTION OF MICROGRITS P240 TO P2500

ICS 25.100.70

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 2003 **Price Group 5**

Abrasives Sectional Committee, BP 09

NATIONAL FOREWORD

This Indian Standard (Part 3) which is identical with ISO 6344-3 : 1998 'Coated abrasives — Grain size analysis — Part 3: Determination of grain size distribution of microgrits P240 to P2500' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Abrasives Sectional Committee and approval of the Basic and Production Engineering Division Council.

The other parts of this Indian Standard are:

IS 15287 (Part 1) : 2003 Coated abrasives — Grain size analysis : Part 1 Grain size distribution test

IS 15287 (Part 2) : 2003 Coated abrasives — Grain size analysis: Part 2 Determination of grain size distribution of macrogrits P12 to P220

The text of the ISO Standard has been approved as suitable for publication as Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker in the International Standard while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

Technical Corrigendun 1 to the above International Standard has been incorporated.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 6344-1 : 1998 Coated abrasives — Grain size analysis — Part 1: Grain size distribution test	IS 15287 (Part 1) : 2003 Coated abrasives — Grain size analysis: Part 1 Grain size distribution test	Identical
ISO 8486-2 : 1996 Bonded abrasives — Determination and designation of grain size distribution — Part 2: Microgrits F230 to F1200	IS 15288 (Part 2) : 2003 Bonded abrasives — Determination and designation of grain size distribution: Part 2 Microgrits F230 to F1200	do
ISO 9138 : 1993 Abrasive grains — Sampling and splitting	IS 15290 : 2003 Abrasive grains — Sampling and splitting	do

Where there are no corresponding Indian Standards for the International Standards referred in this Indian Standard reference to the relevant International Standards may be made.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

COATED ABRASIVES — GRAIN SIZE ANALYSIS

PART 3 DETERMINATION OF GRAIN SIZE DISTRIBUTION OF MICROGRITS P240 TO P2500

1 Scope

This part of ISO 6344 sets forth a method for determining or testing the grain size distribution of electro-fused aluminium oxide and silicon carbide microgrits P240 to P2500 for coated abrasives as defined in ISO 6344-1.

It applies both to those grits used in the manufacture of coated abrasive products and to those grits taken from products for testing purposes.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 6344. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 6344 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6344-1:1997, *Coated abrasives – Grain size analysis – Part 1: Grain size distribution test.*

ISO 8486-2:1996, *Bonded abrasives – Determination and designation of grain size distribution – Part 2: Microgrits F230 to F1200.*

ISO 9138:1993, *Abrasive grains – Sampling and splitting.*

3 Definitions

For the purposes of this part of ISO 6344 the definitions given in ISO 6344-1 apply.

4 Testing of microgrits P240 to P1200

4.1 General

The testing of microgrits P240 to P1200 by sedimentation shall be carried out using the US sedimentometer whereby the grain size distribution is determined, see ISO 8486-2.

The limits are specified in table 2 of ISO 6344-1:1998 which is reproduced as table 1 in this part of ISO 6344.

Table 1 — Grain size distribution of microgrits P240 to P1200 d_s-values for testing with the US sedimentometer

Grit designation	d_{s0}-value max. µm	d_{s3}-value max. µm	Median grain size d_{s50}-values µm		d_{s95}-value min. µm
P240	110	81,7	58,5	± 2	44,5
P280	101	74	52,2	± 2	39,2
P320	94	66,8	46,2	± 1,5	34,2
P360	87	60,3	40,5	± 1,5	29,6
P400	81	53,9	35	± 1,5	25,2
P500	77	48,3	30,2	± 1,5	21,5
P600	72	43	25,8	± 1	18
P800	67	38,1	21,8	± 1	15,1
P1000	63	33,7	18,3	± 1	12,4
P1200	58	29,7	15,3	± 1	10,2

Permissible deviations are given in table 2.

Table 2 — Permissible deviations resulting from the variations due to the measuring technique (US sedimentometer)

Grit designation	Permissible deviation for values		
	d_{s3} µm	d_{s50} µm	d_{s95} µm
P240	+ 1,5	± 1,5	- 1,5
P280			
P320			
P360	+ 1,5	± 1	- 1,5
P400			
P500			
P600	+ 1,5	± 0,8	- 1,5
P800			
P1000			
P1200			

4.2 Designation of the test method

The designation of the test method by means of the US sedimentometer for microgrits P240 to P1200 reads:

Test method – Micro P

4.3 Test procedure

4.3.1 Preparation of the sample

Prior to the test the sample shall be heated at a temperature of (600 ± 20) °C for at least 10 minutes. To remove agglomerates it is recommended that the dispersed sample be treated by means of ultrasonics for example.

Take the quantity necessary for sedimentation from a statistically representative sample.

This quantity shall be enough to give a height corresponding to 20 to 25 graduations, i.e. approximately 1,6 g for silicon carbide and approximately 2,2 g for electro-fused aluminium oxide, in the collecting tube after sedimentation.

For sampling and splitting of abrasive grains, see ISO 9138.

4.3.2 Sample dispersion

Pour 15 ml of sedimentation medium containing the specified quantity of dispersing agent and the sample to be sedimented into a test tube and shake the tube to achieve perfect dispersion.

Allow the grits to stand in the sedimentation medium for at least 30 minutes; shake the test tube vigorously several times during this period. The temperature of the medium in the test tube shall be the same as the temperature of the medium in the sedimentation tube.

NOTE— More complete dispersion may be required if, during testing, the first sedimented grains are agglomerated.

In this case, the test portion shall be submitted to ultrasonic treatment.

4.3.3 Transfer to the sedimentation tube

Put a suitable funnel on the top of the sedimentation tube. Shake the test tube containing the grain dispersion vigorously for 30 s and transfer its contents rapidly to the sedimentation tube by holding the test tube inverted with the open end level with the top of the funnel so that the sample flows down the slope of the funnel and onto the top of the sedimentation medium.

Remove the funnel quickly to prevent grains from dropping into the tube after settling has begun and distorting the results.

4.3.4 Initial point of measurement

Measurement begins at the time of transfer. The stop watch shall be started then.

4.3.5 Determination of d_{s0}

To determine the maximum equivalent diameters of the grains, the time taken by the first grain to reach the collecting tube bottom shall be measured in minutes and hundreds of a minute from the sample injection (initial point of measurement).

This time interval corresponds to a grit equivalent diameter for electro-fused aluminium oxide or for silicon carbide.

The equivalent diameter of the first sedimented grain is called d_{s0}.

This value shall not exceed the maximum value given in table 1 for the grit under test.

If the result is outside the limits, further tests on samples from the same batch should be carried out.

4.3.6 Recording of measured values for the grain size distribution curve

The falling grains shall be observed and recordings shall be made in minutes and hundreds of a minute of the times taken when:

- the first constant grain flow reaches the collecting tube bottom (initial point of the curve);
- the top level of the sedimented volume reaches the various graduations of the collecting tube;
- the top level of the sedimented volume no longer rises (end point of the curve).

During sedimentation the rubber stopper at the bottom of the collecting tube shall be tapped gently. This operation can be carried out using a machine but shall not affect the metal base holding the tube itself.

Agglomeration or flocculation of grains during sedimentation is a sign of inadequate sample preparation (see 4.3.1). In this case the test shall be repeated.

4.3.7 Interpretation of the grain size distribution curve

The values of d_{s3}, d_{s50} and d_{s95} shall be read from the grain size distribution curve and compared with the permissible values for the grit considered in table 1.

The sample is said to be within standard, if all the values d_{s0}, d_{s3}, d_{s50}, and d_{s95} are within the permitted limits.

The sample is said to be out of standard, if one value is outside the permitted limits of this part of ISO 6344.

5 Testing of microgrits P1500 to P2500

5.1 General

The testing of microgrits P1500 to P2500 by sedimentation is based on the micro-P-mastergrits P1500, P2000 and P 2 500 (of fused aluminium oxide).

The limits are specified in table 3 of ISO 6344-1:1998 which is reproduced as table 3 in this part of ISO 6344.

Table 3 — Grain size distribution of the microgrits P1500 to P2500

Grit designation	d_{s0}-value1) max. mm	d_{s3}-value max. mm	Median grain size d_{s50}-value mm	d_{s95}-value min. mm
P1500	58	25,8	12,6 ± 1,0	8,3
P2000	58	22,4	10,3 ± 0,8	6,7
P2500	58	19,3	8,4 ± 0,5	5,4

These values apply only to measurement by means of the US-sedimentometer according to ISO 8486-2.

1) Determined on the basis of the standard deviations resulting from an ISO round robin test.

5.2 Designation of the test method

The designation of the test method for microgrits P 1 500 to P 2 500 with indication of the measuring instrument used shall read:

Test-Micro P – US sedimentometer,

or

Test-Micro P – Eppendorf Photosedimentometer,

or

Test-Micro P – Coulter® Multisizer II to "others".

5.3 Test procedure

The test method is based on the micro-P-mastergrits P1500, P2000 and P2500 (of fused aluminium oxide)[1].

Each micro-P-mastergrit shall be accompanied by a certificate of the Staatliche Materialprüfungsanstalt Darmstadt (MPA) indicating the d_{s0}- and d_{s50}-values determined by the US sedimentometer. The value measured shall be corrected on the basis of the mastergrit values.

The determination of grain sizes with other measuring instruments than the US sedimentometer, e.g. with the Eppendorf-Photosedimentometer, with the different types of sedigraphs or with instruments using other principles of measurement may give deviating results.

The test shall be carried out in accordance with the instructions for the measuring instrument used.

5.3.1 Preparation of the sample

Prior to the test the sample shall be heated at a temperature of (600 ± 20) °C for at least 10 minutes. It is recommended that the sample is dispersed by means of ultrasonics for example.

5.3.2 Determination of grain size distribution

The principle of this part of ISO 6344 upon which the evaluation of the test results obtained by sedimentation for the 3 %-, 50 %- and 95 %-points is based, is the comparison of the median (50 %) size determined in an ISO round robin test on the micro-P-mastergrits P1500, P2000 and P2500 of MPA Darmstadt with that determined by the testing laboratory on its own instruments.

The difference between these two values will also be added algebraically to the 3 %-, 50 %- and 95 %-values of the sample.

For the d_{s0}-value calculate the difference between the measured values of the micro-P-mastergrit and the sample.

The following method applies:

- Determine the d_{s0}-value of the micro-P-mastergrit and calculate the difference between this value and the corresponding value shown on the MPA Darmstadt certificate.

- Measure the d_{s0}-value of the sample and add algebraically the mastergrit difference as determined above for the d_{s0}-value.

---

[1] Micro-P-mastergrits P1500 to P2500 can be obtained by Staatliche Materialprüfungsanstalt Darmstadt, Grafenstraße 2, D-64283 Darmstadt.

This information is given for the convenience of users of this part of ISO 6344 and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

– Determine the d_{s50}-value of the micro-P-mastergrit and calculate the difference between this value and the corresponding value shown on the MPA Darmstadt certificate.

– Measure the d_{s3}-, d_{s50}-, d_{s95}-values of the sample and add algebraically the mastergrit difference as determined above for the d_{s50}-value.

– The corrected measured results shall be compared with the values in table 3.

Example: SiC P2000, for d_{s50}-value

Mastergrit (MG):

MG-d_{s50}-value according to MPA certificate	10,0 µm
MG-value measured	9,5 µm
Difference	+ 0,5 µm

Sample:

d_{s50}-value measured	9,4 µm
To be added	+ 0,5 µm
Corrected d_{s50}-value of the sample	9,9 µm

According to table 3 this is within the tolerances of the d_{s50}-value for grit P2000.

5.3.3 Evaluation of the test results

A sample complies with the standard, if the d_{s0}-, d_{s3}-, d_{s50}- and d_{s95}-values corrected as described in clause 5.3.2 are within the permissible limits given in table 3.

When checking the measured results, allowance must be made for the variations due to the measuring technique. These permissible deviations given in table 4 were determined on the basis of the standard deviations resulting from an ISO round robin test. The tolerances for production microgrits given in table 3 are to be increased by these values. It is helpful if a form of the type shown in annex A is used for the recording and interpretation of the data. An example of test results is given in annex B.

Table 4 — Permissible deviations resulting from the variations due to the measuring technique

Grit designation	Permissible deviations for values			
	d_{s0}- µm	d_{s3}- µm	d_{s50}- µm	d_{s95}-value µm
P1500	+5	+ 2	± 1	-0,5
P2000	+5	+ 1,5	± 0,5	-0,4
P2500	+5	+ 1,5	± 0,5	-0,4

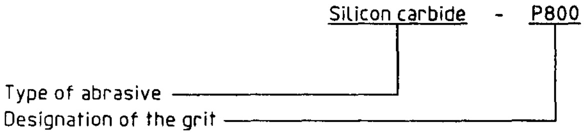
6 Designation

The designation of microgrits for fused aluminium oxide or silicon carbide complying with the requirements of this part of ISO 6344 shall comprise

a) the type of abrasive;

b) the designation of the grit including the letter "P" for a coated abrasive followed by a characteristic number representing the grit size.

EXAMPLE:



7 Marking

When packing grits of fused aluminium oxide and silicon carbide for coated abrasive products, the grit designation, i.e. P 240, shall be marked on each of the smallest packing units.

Annex A
(informative)

Form for recording results of a sedimentation analysis of microgrits of the P series using the US sedimentometer

Testing of microgrits P240 to P1200 - ISO 6344-3: ....

Abrasive: .... Supplier/Purchaser: ....

Grit designation: .... Delivery date:

1	2	3	4	5
Height of sedimentation *h* in division lines	**Time of sedimentation** *t* min.	**Volume percentage of the sample**	**Grain size** *d* mm	**Remarks**
–		–		First grain (d_{50})
0				First continuous flow of particles
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

Date of testing: .... Tested by:

....

Annex B
(informative)

Example of the presentation of the test data for the grain size distribution of fused aluminium oxide

Testing of microgrits P240 to P1200 - ISO 6344-3: ....

Abrasive: Fused aluminium oxide........................ Supplier/Purchaser: Braun ....

Grit designation: P500 .... Delivery date: 84-05-30

1	2	3	4	5
Heigth of sedimentation *h* in division lines	**Time of sedimentation** *t* min.	**Volume percentage of the sample**	**Grain size** *d* µm	**Remarks**
–	1,10	–	76,0	First grain (d_{S0})
0	2,56	0	50	First continuous flow of particles
1	3,28	4,2	44	
2	3,78	8,3	41	
3	4,03	12,5	39,7	
4	4,40	16,7	38	
5	4,74	20,8	36,6	
6	5,10	25,0	35,3	
7	5,43	29,2	34,2	
8	5,67	33,3	33,5	
9	5,90	37,5	32,8	
10	6,20	41,7	32	
11	6,52	45,8	31,2	
12	6,70	50,0	30,8	
13	6,97	54,2	30,2	
14	7,25	58,3	29,6	
15	7,55	62,5	29	
16	7,87	66,7	28,4	
17	8,08	70,8	28	
18	8,69	75,0	27,1	
19	9,25	79,2	26,2	
20	9,85	83,3	25,4	
21	10,67	87,5	24,4	
22	11,80	91,7	23,2	
23	13,24	95,8	21,9	
24	15,26	100,0	20,4	
25	–	–	–	

Date of testing: 84-05-30 Tested by: P. Durand

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This Indian Standard has been developed from Doc : No. BP 09 (0292).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at New India Printing Press, Khurja, India